

**AMENDMENTS TO THE CLAIMS**

*Please amend the Claims as follows:*

- 1. (Previously Presented)** A computer-based method comprising the steps of:
  - a. choosing an initial base length with which to encode local identifiers,
  - b. assigning a value of zero as a node identifier to a root node in a logical tree,
  - c. sequentially assigning to descendants of a root node a local identifier having an even value and a length equal to said base length chosen in said choosing step, wherein said local identifiers are assigned in increasing value from leftmost children to rightmost children,
  - d. assigning node identifiers by concatenating local identifiers of all nodes along a path from a root node to a node to which a node identifier is currently being assigned, and
  - e. extending said initial base length when local identifier encoding combinations are exhausted before all descendants are assigned local identifiers.
- 2. (Previously Presented)** The computer-based method of claim 1, wherein inserting a node into an existing tree does not require change to existing node identifiers.
- 3. (Previously Presented)** The computer-based method of claim 1, wherein a node is inserted between a first node and a second node having consecutive local identifiers.
- 4. (Previously Presented)** The computer-based method of claim 3, wherein said inserted node is assigned a local identifier having a string length longer than string length of said first node.
- 5. (Previously Presented)** The computer-based method of claim 1, wherein assigning said node identifier to an inserted node comprises the following steps:

- a. determining whether node to be inserted is inserted as a first child, between two existing siblings, or as a last child under a single parent node,
- b. when said node to be inserted is inserted as a first child under said single parent node,
  - i. checking last byte of an existing first child,
  - ii. when the value of said last byte is not the smallest even number, then an even number greater than zero and less than the value of said last byte is selected to generate a local identifier of said node to be inserted, else
  - iii. when the value of said last byte of an existing first child is the smallest even number, generating a local identifier for said node to be inserted by replacing said last byte of said existing first child by an odd number to generate a local identifier and extending node identifier of said existing first child by a byte having a value of any arbitrary even number,
- c. when said node to be inserted is inserted between two existing siblings under said single parent node, determining whether the string length of node identifier of said first sibling is less than, equal to, or greater than the string length of node identifier of said second sibling, else
- d. when said node to be inserted is inserted as a last child after all other children under said single parent node, assigning to said node to be inserted an even local identifier greater than that of existing last child under said single parent node, and  
generating a node identifier by a concatenation of local identifiers of all nodes  
along a path from a root node to said node to be inserted.

**6. (Previously Presented)** The computer-based method of per claim 5, when said node to be inserted is inserted between two existing siblings under said single parent node and when the

string length of local identifier of said first sibling is less than the string length of the local identifier of said second sibling,

a. checking when local identifier of said first sibling is the last available encoding value having a string length of the local identifier of said first sibling and being smaller in value than said local identifier of said second sibling,

b. when said local identifier of said first sibling is the last combination having a string length of the local identifier of said first sibling that is smaller in value than said local identifier of said second sibling,

i. when the local identifier of said second sibling is not the first available identifier having the string length of the local identifier of said second sibling that is greater than the value of said local identifier of said first sibling; an even-valued local identifier being less in value than said local identifier of said second sibling and having string length of local identifier of said second sibling is generated and assigned, else

ii. generating a local identifier for said node to be inserted by replacing said last byte of said existing first child by an odd number and extending local identifier of said existing first child by a byte having a value of any arbitrary even number less in value than said last byte of said existing first child, and

generating a node identifier by a concatenation of local identifiers of all nodes along a path from a root node to said node to be inserted.

**7. (Previously Presented)** The computer-based method of claim 5, when said node to be inserted is inserted between two existing siblings under said single parent node and when the

string length of the local identifier of said first sibling is equal to the string length of the local identifier of said second sibling,

a. when the value of the local identifier of said first sibling plus two is less than the value of the local identifier of said second sibling, a local identifier for said node to be inserted takes on an even value greater than or equal to the value of said local identifier of first sibling plus two and less than the value of the local identifier of said second sibling,

b. when the string length of the local identifier of said first sibling plus two is equal to the string length of the local identifier of said second sibling, then the string length of the local identifier for said node to be inserted is extended wherein the length of the local identifier for the newly inserted node is the string length of said second sibling plus one, and the value of the first string length of said first sibling bytes is the node identifier of said first sibling plus one, and the new byte is an arbitrary even number less than the value of said last byte of the node identifier of said second sibling, and

generating a node identifier by a concatenation of local identifiers of all nodes  
along a path from a root node to said node to be inserted.

**8. (Previously Presented)** The computer-based method of claim 5, when said node to be inserted is inserted between two existing siblings under said single parent node and when the string length of the local identifier of said first sibling is greater than the string length of the local identifier of said second sibling

a. when the local identifier of said second sibling is not the smallest value having the string length of said second sibling that is greater in value than the local identifier of said first sibling, then a local identifier having a string length of said second sibling and having even value

smaller than the value of the last byte of the node identifier of said second sibling is generated and assigned else,

b. when the local identifier of said first sibling is not the largest value with the string length of the local identifier of said first sibling, one of the larger values for the new encoding is generated and assigned, else

c. extending the local identifier of said first sibling by a length, by setting the last byte to the highest odd number and the new byte to an even number less than the value of the last byte, and

generating a node identifier by a concatenation of local identifiers of all nodes along a path from a root node to said node to be inserted.

**9. (Currently Amended)** An article of manufacture, said article of manufacture comprising a computer readable storage medium having computer readable program code embodied therein, said computer readable program code comprising modules being executed by a computer ~~comprising modules implementing code to:~~

- a. choose an initial base length with which to encode local identifiers,
- b. assign a value of zero as a node identifier to a root node in a logical tree,
- c. sequentially assign to descendants of a root node a local identifier having an even value and a length equal to said base length chosen in said choosing step, wherein said local identifiers are assigned in increasing value from leftmost children to rightmost children,
- d. assign node identifiers by concatenating local identifiers of all nodes along a path from a root node to a node to which a node identifier is currently being assigned, and
- e. extend said initial base length when local identifier encoding combinations are exhausted before all descendants are assigned local identifiers.

**10. (Previously Presented)** The article of manufacture of claim 9, wherein assigning a prefix encoded node identifier to an inserted node comprises modules implementing code to:

- a. determine whether node to be inserted is inserted as a first child, between two existing siblings, or as a last child under a single parent node,
- b. when said node to be inserted is inserted as a first child under said single parent node,
  - i. check last byte of an existing first child,
  - ii. when the value of said last byte is not the smallest even number, then an even number greater than zero and less than the value of said last byte is selected to generate a local identifier of said node to be inserted, else
  - iii. when the value of said last byte of an existing first child is the smallest even number, generate a local identifier for said node to be inserted by replacing said last byte of said existing first child by an odd number to generate a local identifier and extending node identifier of said existing first child by a byte having a value of any arbitrary even number,
- c. when said node to be inserted is inserted between two existing siblings under said single parent node, determine whether the string length of node identifier of said first sibling is less than, equal to, or greater than the string length of node identifier of said second sibling, else
- d. when said node to be inserted is inserted as a last child after all other children under said single parent node, assign to said node to be inserted an even local identifier greater than that of existing last child under said single parent node, and  
  
generate a node identifier by a concatenation of local identifiers of all nodes along  
  
a path from a root node to said node to be inserted.

**11. (Previously Presented)** The article of manufacture of claim 10, wherein when said node to be inserted is inserted between two existing siblings under said single parent node and when the string length of local identifier of said first sibling is less than the string length of the local identifier of said second sibling, comprises modules implementing code to:

a. check when local identifier of said first sibling is the last available encoding value having a string length of the local identifier of said first sibling and being smaller in value than said local identifier of said second sibling,

b. when said local identifier of said first sibling is the last combination having a string length of the local identifier of said first sibling that is smaller in value than said local identifier of said second sibling,

i. when the local identifier of said second sibling is not the first available identifier having the string length of the local identifier of said second sibling that is greater than the value of said local identifier of said first sibling; an even-valued local identifier being less in value than said local identifier of said second sibling and having string length of local identifier of said second sibling is generated and assigned, else

ii. generate a local identifier for said node to be inserted by replacing said last byte of said existing first child by an odd number and extending local identifier of said existing first child by a byte having a value of any arbitrary even number less in value than said last byte of said existing first child, and

generate a node identifier by a concatenation of local identifiers of all nodes along a path from a root node to said node to be inserted.

**12. (Previously Presented)** The article of manufacture of claim 10, wherein when said node to be inserted is inserted between two existing siblings under said single parent node and when the string length of the local identifier of said first sibling is equal to the string length of the local identifier of said second sibling, comprises modules implementing code to:

a. when the value of the local identifier of said first sibling plus two is less than the value of the local identifier of said second sibling, a local identifier for said node to be inserted takes on an even value greater than or equal to the value of said local identifier of first sibling plus two and less than the value of the local identifier of said second sibling,

b. when the string length of the local identifier of said first sibling plus two is equal to the string length of the local identifier of said second sibling, then the string length of the local identifier for said node to be inserted is extended wherein the length of the local identifier for the newly inserted node is the string length of said second sibling plus one, and the value of the first string length of said first sibling bytes is the node identifier of said first sibling plus one, and the new byte is an arbitrary even number less than the value of said last byte of the node identifier of said second sibling, and

generate a node identifier by a concatenation of local identifiers of all nodes along a path from a root node to said node to be inserted.

**13. (Previously Presented)** The article of manufacture of claim 10, wherein when said node to be inserted is inserted between two existing siblings under said single parent node and when the string length of the local identifier of said first sibling is greater than the string length of the local identifier of said second sibling, comprises modules implementing code to:



a. when the local identifier of said second sibling is not the smallest value having the string length of said second sibling that is greater in value than the local identifier of said first sibling, then a local identifier having a string length of said second sibling and having even value smaller than the value of the last byte of the node identifier of said second sibling is generated and assigned else,

b. when the local identifier of said first sibling is not the largest value with the string length of the local identifier of said first sibling, one of the larger values for the new encoding is generated and assigned, else

c. extending the local identifier of said first sibling by a length, by setting the last byte to the highest odd number and the new byte to an even number less than the value of the last byte, and

generate a node identifier by a concatenation of local identifiers of all nodes along a path from a root node to said node to be inserted.

**14. (Previously Presented)** The computer-based method of claim 1, wherein said assigned local identifiers are assigned values based on variable-length binary string encoding.

**15. (Previously Presented)** The article of manufacture of claim 9, wherein said assigned local identifiers are assigned values based on variable-length binary string encoding.

**16. (Previously Presented)** A computer-based method comprising the steps of:

- a. choosing an initial base length with which to encode local identifiers,
- b. assigning a value of zero as a node identifier to a root node in a logical tree,
- c. sequentially assigning to descendants of a root node a local identifier having an even value and a length equal to said base length chosen in said choosing step, wherein said local

identifiers are assigned said even values based on variable-length binary string encoding and said local identifiers are assigned in increasing value from leftmost children to rightmost children,

d. assigning node identifiers by concatenating local identifiers of all nodes along a path from a root node to a node to which a node identifier is currently being assigned, and extending said initial base length when local identifier encoding combinations are exhausted before all descendants are assigned local identifiers.